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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

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GROUP 1700

Application Number: 10/612,658
Filing Date: July 02, 2003
Appellant(s): GALLIGAN ET AL.

Scott S. Servilla
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed February 28, 2007 appealing from the Office action mailed August 29, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The following are the related appeals, interferences, and judicial proceedings known to the examiner which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal:

Decision on appeal of Application 10/376,836 from the Board of Patent Appeals and Inteferences, May 21, 2007. Application 10/376,836 is a continuation of 09/301,626 and the instant Application is a continuation of 09/586,445, which in turn is a CIP of 09/301,626. The claims in Application '836 are drawn to a catalyst member having a carrier, an anchor layer and a catalytic layer, same as the layers required in the instant application. The difference is the claims in Application '836 do not require the shape of "tube of corrugated construction".

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

4,0273,67	Rondeau	07-1977
4,455,281	Ishida et al	06-1984
5,204,302	Gorynin et al	04-1993
4,798,770	Donomoto et al	01-1989
6,042,879	Draghi et al	03-2000
EP 0 831 211	Uchida et al	03-1998
2001/0006008	Dean et al	07-2001
5,713,906	Grothues-Spork et al	02-1998
6,221,075	Tomala et al	04-2001

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-3, 5-6, 31-34, 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishida et al (4,455,281) in view of EP 0 831 211.

Ishida et al discloses a method of producing a plate-shaped catalyst unit for NO_x reduction of exhaust gas wherein the catalytic substance if prevented from falling off (note column 2, lines 17-10).

The catalyst unit is produced by a method comprising the steps of spraying molten metal upon the surfaces of a metal plate to allow the molten metal to accumulate thereon to form rough surfaces and depositing a catalyst containing titanium and at least another catalytic material for NO_x reduction of exhaust gas onto said rough surfaces whereby the catalyst is firmly secured on said rough surfaces (note claim 1). Ishida '281 further discloses that forming the surfaces of the metal plate into rough surfaces is effected by molten metal spraying. In the typical case, a metal wire is heated to be molten by contact resistance of electricity, an electric arc or high temperature flames, and molten metal thus obtained are sprayed together with gas such as compressed air through nozzles on the surfaces of the metal plate in the forms of very small droplets of molten metal allowing the molten metal to solidly secured thereto. As the molten metal sprayed, the same type of material as the metal plate is preferred. Then a catalytic substance is attached onto the surfaces of the metal plate formed into

rough surfaces by the molten metal spraying (note column 4, line 62 to column 5, lines 13).

Thus, Ishida '281 fairly teaches that the formation of the rough surfaces by electric arc process, such rough surfaces are considered the same as the claimed anchor layer, would facilitate the bonding between the catalytic substance and the metal carrier.

The metal plate can be thin steel plates, such as ASTM type 430, type 410 and type 304 (note column 4, lines 53-61). Ishida '281 also discloses that a metal wire mesh can be used instead of metal plate (note column 1, lines 55-58). Moreover, the metal plate can be subjected to bending work as shown in Figures 3-4, when those bent plates are piled up, bent portions hold spaces there between, whereby spacers which would otherwise be necessary can be saved, resulting in increased catalytic area (note column 3, lines 61-68). The shapes shown in Figures 3-4 are considered as having "accordion pleats" or "corrugated" structure. The metal plate in Ishida '281 can also be perforated metal plate (note Figures 7-9).

Since the metal plate in Ishida '281 can be bent, one skilled in the art would be able to use such metal plate to form a conformable catalyst member as required in the instant claims.

The difference is Ishida '281 does not disclose that a tube of corrugated construction.

EP '211 discloses an exhaust emission control device for internal combustion engines (note column 1, lines 11-19). Such device can have a catalytic metal bearing

(or support) member that can be a hollow cylinder (i.e., tube), which is made of a porous metal sheet, (note Figures 12-13 and column 11, lines 39-42) or a corrugated porous plate (note Figure 16D). EP '211 further discloses that the "steel sheet" bearing catalytic metal should be understood as not being limited to the construction described in relation to various embodiments and modifications and also as not being limited to the porous sheet (note column 14, lines 17-22). Thus, EP '211 fairly suggests that the hollow cylinder can be made from other type of metal sheet, such as the corrugated porous plate of Figure 16D.

EP '211 further discloses that a support structure can be used (note Figures 5-6, item 23 and column 6, lines 15-45). This support structure is considered the same as the mounting flange as required in the instant claim 32.

For the limitation regarding the shape of the support member, it would have been obvious to one skill in the art at the time the invention was made to shape the catalyst support member of Ishida '281 as a corrugated, perforated tube, as suggested by EP '211 because such shape is desired for catalyst used in internal combustion engine.

Claims 30, 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishida '281 in view of EP '211 as applied to claims 1-3, 5-6, 31-34, 36 above, and further in view of Donomoto (4,798,770) or Draghi et al (6,042,879).

The difference not yet discussed is Ishida '281 does not disclose that the anchor layer comprises nickel and aluminum.

However, Ishida '281 teaches that the molten metal sprayed is preferred to be the same type of material as the metal plate (note column 5, lines 9-10) and the metal plate is desired to be heat resistance and corrosion resistance (note column 4, lines 53-61) such as stainless steel. However, the teaching of Ishida '281 should not be limited to just the exemplified metals.

Donomoto '770 discloses that alloys include Ni-Cr alloys, Ni-Al alloys containing 3-20% Al, Ni-Cr-Al alloys, Ni-Cr-Al-Y alloys are heat and corrosion resistant (note column 5, lines 51-63).

Alternatively, Draghi '879 teaches that MCrAlY, where M is nickel and/or cobalt, has corrosion and heat resistant properties (note column 4, lines 7-14). It would have been obvious to one skilled in the art to optimize the composition of the MCrAlY alloy to obtain the desired corrosion and heat resistant properties.

It would have been obvious to use any known metal that is heat and corrosion resistance, such as the MCrAlY alloys suggested by Donomoto '770 or Draghi '879 for the catalyst of Ishida '281 because heat and corrosion metal is desired in Ishida '281.

Claims 1-3, 5-6, 30-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gorynin (5,204,302) in view of EP '211, optionally further in view of Rondeau (4,027,367) and Ishida '281.

Gorynin '302 discloses a catalyst comprising a metallic substrate; an adhesive sublayer diffusion bonded onto said substrate; and a catalytically active layer deposited on said sublayer and a porous layer deposited on said catalytically active layer (note

claim 1). The adhesive sublayer is prepared from thermally reactive powders, such as those prepared from nickel and titanium, aluminum with at least one or more of Co, Cr, Mo, Ta, Nb, Ti or Ni or silicon with at least one or more of Ti, Nb, Cr, W, Co, Mo, Ni or Ta (note column 2, lines 25-35). For the composition of the Ni alloy used, it would have been obvious to one of ordinary skill in the art to optimize such composition to obtain the best adhesive layer.

Gorynin '302 further discloses that the catalyst can be used for the purification of waste gases from an internal combustion engine (note column 1, lines 6-10). Gorynin '302 further discloses that because of the strong adhesion of the catalyst layers to the substrate, the catalyst can be corrugated and punched after deposition of the catalyst layer (note column 3, lines 57-60). Furthermore, Gorynin '302 discloses the step of rolling a corrugated catalyst strip into a cylinder (note column 9, lines 64-67).

The adhesive layer in Gorynin is formed by plasma spraying. The thermally reactive powders are introduced into a plasma torch and an exothermic reaction is initiated in the torch. The exothermic powders impinge the substrate where the reaction continues. The heat generated in the reaction causes diffusion of the sub-layer into the substrate resulting in a diffusion bond and strong adhesion of the sublayer to the substrate (note column 3, lines 6-15). Thus, Gorynin '302 fairly teaches that the plasma spraying process is used to obtain a diffusion layer, which improves the bonding between the two layers.

The process limitation in claim 6 is noted. However, when the examiner has found a substantially similar product as in the applied prior art, the burden of proof is

shifted to applicant to establish that their product is patentably distinct and not the examiner to show the same process of making. *In re Brown*, 173 USPQ 685 and *In re Fessmann*, 180 USPQ 324.

Optionally Rondeau '367 is applied as stated below to teach the use of electric arc to form the adhesive layer.

Rondeau '367 discloses a method of thermal spraying a substrate to deposit a self-bonding coating on such substrate, comprising supplying an electric arc thermal spray gun with a wire feed comprising an alloy of nickel and aluminum or titanium, and using such electric arc thermal spray gun, spraying said wire feed onto such substrate to coat the same thereby to establish diffusion bond between such coating and such substrate to provide a self-bonding coating on such substrate (note claim 1). Rondeau '367 discloses that several types of thermal spraying guns are available including combustion flame spray guns, e.g., the oxy-fuel gas type, plasma arc spray guns and electric arc spray guns. Combustion flame spray guns require a source of fuel, such as acetylene, and oxygen and the temperature produced therein are usually relatively low and often incapable of spraying materials having melting points exceeding 5,000°F. Plasma arc spray guns are usually the most expensive type and they produce much higher temperatures than the combustion type, e.g. up to approximately 30,000°F. Furthermore, plasma arc spray gun require a source of inert gas, such as argon, for creation of the plasma, and the gas flow rate and electric power therefor require extremely accurate control for proper operation. On the other hand an electric arc spray gun simply requires a source of electric power and a supply of compressed air or other

gas, as is well known, to atomize and to propel the melted material in the arc to the substrate or target (note column 1, lines 25-43).

In undertaking the method of Rondeau '367 a number of important advantages are realized over the prior art. Firstly, the process uses an electric arc spray gun, which is more economically operated than other thermal spray equipment. Second, the material to be sprayed is supplied as a wire, which is more convenient to use than powder.. The wire may be thin strand all the way up to a relatively thick rod as long as it is suitable for spraying through an electric arc spray gun. Third, the wire is readily formed as an alloy of the two primary materials nickel and aluminum or nickel and titanium. Fourth, the cohesive, adhesive and hardness attributes of the coating on an article formed by the method of the invention are generally equivalent to or better than corresponding attributes for a coating on an article sprayed with powder using other thermal spray devices (note paragraph bridging columns 2-3).

Rondeau '367 can be further applied to teach that the wire alloy comprises a minimum of 93% nickel, from 4 to 5.2% aluminum, from 0.25 to 1.00% Ti (note column 4, lines 15-20).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to use electric arc spraying method, instead of plasma spraying, to form the adhesive layer in Gorynin '302, as suggested by Rondeau '367 because electric arc spraying method can form the same diffusion bond between the two layers but it would cost less plus the additional advantages as stated above.

Optionally, Ishida '281 can be applied as stated above to teach that it is known in the art to form an adhesive layer on a substrate of a catalyst by using electric arc spraying process before depositing the catalytic layer in order to form a catalyst that is highly resistant to peel off (i.e. better bonding) (note column 7, lines 62-67).

EP '211 is applied as stated above to teach the desired shape of the catalyst member, i.e., a hollow cylinder.

It would have been obvious to roll the corrugated catalyst strip of Gorynin '302 into a hollow cylinder as suggested by EP '211 because such shape is desirable for an analogous application.

(10) Response to Argument

<u>**Argument I**</u>

Claim 1:

<u>Tube of corrugated construction:</u>

Appellants argue that Figure 16C of EP '211 only shows a porous catalytic member, not corrugated.

In previous office action, Figure "16C" was a typographical error; Figure "16D" was intended to show a catalyst member with a corrugated structure. It should be noted that by looking at all the figures on page 21 of EP '211, which include Figures 16C and 16D, and the "16C" typographical error would be apparent since a "corrugated porous plate" was mentioned in the rejection.

Carrier tube that can be bent for use in a conformable catalyst member

Appellants argue that there is no teaching or suggestion in Ishida or EP '211 of carrier comprising a tube of corrugated construction that can be bent and retain the catalytic layer on the carrier or a carrier adapted for use in a conformable carrier member.

Ishida '281 fairly teaches that the metal plates can be bent (note column 3, lines 61-65) and can be perforated (note Figure 7). Ishida '281 also teaches that the rough surfaces prevent the catalyst substance from falling off (note column 2, lines 17-20). The only thing Ishida '281 does not teach is the corrugated tube shape for the catalyst carrier. EP '211 is applied as stated above to teach that tube shape is desirable (note Figure 16B for example), the corrugated, perforated carrier is also preferred (note Figure 16D). Thus, it would have been obvious to one of ordinary skill in the art shape the carrier of Ishida '281 into any shape that is suitable for being used in exhaust purifying apparatus for combustion engine, such as a corrugated tube shape as suggested by EP '211. As for the limitation "conformable", it should be noted that the catalyst member, as shown in Figure 16B of EP '211, is designed to fit at a bend of an exhaust purifying apparatus, thus, the catalyst member is considered as being "conformed". Also, Appellants' claims are drawn metal carriers that are "conformable", however, the claims are broad enough to include carriers that are shaped to fit into the exhaust purifying apparatus before depositing the anchor layer and/or the catalytic coating as long as the catalytic layer has good bonding with the anchor layer. Alternatively, since the rough surfaces in Ishida '281, i.e. the anchor layer, are formed

by electric arc, just as in Appellants' claimed invention, the anchor layer in Ishida '281 would be as "capable of retaining a catalytic coating applied thereto intact on the carrier when the carrier is bent" as the anchor layer in Appellants' claims.

Appellants argue that in Ishida, it is disclosed that the metal plate "is preferably thin, but toughness of the metal plate is required in order not to easily yield to deformation", thus, the substrate in Ishida cannot be bent.

It should be noted that when a metal plate has "toughness", it does not mean that such metal plate is not flexible or cannot be bent. Dean et al (2001/0006008) (note paragraph [0022]), Tormala et al (6,221,075) (note column 1, lines 60-67) and Grothues-Spork et al (5,713,906) (note column 2, lines 10-12) are cited to teach that a metal plate or strip, such as stainless steel metal, can be "tough" and "flexible" or "ductile" at the same time. Furthermore, Ishida '281 teaches that the metal plate should not "easily yield to deformation" (note column 4, lines 50-52), meaning accidental changing in shape is undesirable, however, the metal plate can still be bent to a desirable shape, note Figures 3-4.

Appellants argue that Figures 5-21 of Ishida for the proposition that substrate can be bent, however, Figures 5-21 do not show or suggest a carrier that is bent or capable of being bent.

Ishida '281 clearly discloses that the metal plates can be subjected to "bending work" (note column 3, lines 61-64).

Appellants urge that the carrier plates shown in Figures 3 and 4 are corrugated but not tubes.

EP '211 is applied as stated above to teach that tube shape is desirable.

Appellants argue that there is no teaching or suggestion in Ishida to bend the plates so that the anchor layer is retained after bending.

Since the anchor layer in Ishida is formed by the same method as in the claimed invention, such layer would inherently be retained after bending. There is no requirement for the actual bending in Appellants' claims.

Appellants argue that the carriers disclosed in Ishida must be rigid and non-deformable, and the carriers in EP '211 are also rigid and not capable of being bent because of the corrugated cushion member, shown in Figure 7.

As stated above, the carriers in Ishida can be subjected to bending (note Figures 3-4). For EP '211, the catalyst member can include a corrugated cushion member, as shown in Figure 7, as stated above by Appellants, but Ishida '281 does teach that when bent flat plates (corrugated plates) are piled up, bent portions hold spaces there between, whereby spacers which would otherwise be necessary can be saved (note column 3, lines 64-68), thus, it would have been obvious to one skilled in the art to use a corrugated shape tube in Figure 7 of EP '211 in order to eliminate the need of the cushion members (which are considered the same as the spacers as disclosed in Ishida '281). Furthermore, the teaching of EP '211 should not be limited to just the embodiment shown in Figure 7. EP '211 also teach that the carrier can be a tube, half-tube, plate, with corrugated and/or perforated features (note Figures 12-16 A-E, column 11, lines 39-51, column 13, lines 10-51, column 14, lines 2-22). Lastly, EP '211 teaches that the corrugated cushion member is resiliently deform (note column 5, lines 33-41),

i.e. the cushion member may be deformed temporarily but it then returns back to the original shape. Since Ishida '281 teaches that the metal carrier should not be yield to deformation, it would have been obvious to one skilled in the art to form the catalyst as disclosed in Ishida '281 in the same shape as the corrugated cushion member, as suggested by EP '211 because such shape can be resilient deform.

Appellants argue that the carriers in EP '211 do not include an intermetallic anchor layer.

EP '211 is not relied upon to teach the anchor layer. Ishida '281 is applied as stated above to disclose the anchor layer.

Appellants argue that the carrier disclosed in EP '211 is not adapted for use in a conformable catalyst member.

Again, the carrier in EP '211 can be used in a bent portion of an exhaust purifying apparatus (note Figures 2, 16A-B), such carrier is considered the same as the claimed "conformable catalyst member".

<u>Ishida teaches away</u>

Appellants argue that Ishida '281 teaches away from the claimed metal carrier because Ishida requires the plate-shaped carrier to be resistant to deformation, and thus the carrier in Ishida could not be used in a conformable catalyst member.

Again, Ishida teaches that the metal plate should not "to easily yield to deformation", this fairly teaches that the metal plate needs to retain its original shape and not be deformed changing to a different shape. This teaching does not teach away

from a carrier that can be bent, in fact, Ishida '281 does specifically disclose that the metal plate can be subjected to bending work (note column 3, lines 61-64).

<u>Anchor layer capable of retaining a catalytic coating applied to the tube</u>

Appellants again argue that in Figure 7 of EP '211, the corrugated sheet does not have a catalytic layer or an intermetallic layer formed thereon.

Again, when the teaching of Ishida '281 is taken in view of the teaching of EP '211, it would have been obvious to use corrugated shape catalyst members in Figure 7 of EP '211 because such shape would eliminate the need of the spacer as suggested by Ishida '281. Furthermore, EP '211 does teach that, in addition to the catalyst as shown in Figure 7, catalyst member having various other shapes and modifications can be used (note column 14, lines 2-22).

Appellants argue that the Final Office Action fails to explain why one skilled in the art would look to the teaching of EP '211, which does not include an intermediate layer on the catalytic steel sheets, to provide a tube of corrugated construction having an anchor layer for retaining a catalytic coating.

As stated in the above rejection, Ishida '281 is applied to teach a catalyst member having a metal substrate, an anchor layer and a catalytic layer. The catalyst of Ishida '281 is suitable to be used for treating exhaust gas from a combustion apparatus (note column 1, lines 13-20) and Ishida '281 teaches that the anchor layer can prevent the catalytic substance from falling off (note column 2, lines 16-20). This anchor layer would not have any direct effect on the performance of the catalyst itself. Thus, even though the catalyst as disclosed in EP '211 does not contain an anchor layer, the

disclosure of EP '211 still fairly suggests to one skilled in the art various desired shapes for the catalyst member. As for the shape of the carrier, see In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966) (The court held that the configuration of the claimed disposable plastic nursing container was a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed container was significant.), especially such shape is known and as suggested by EP '211. It should be noted that EP '211 fairly discloses a similar catalyst member to the catalyst member of Ishida '281, they both comprises a catalytic substance layer on a metallic carrier and both catalyst member can be used for combustion engine. Since the anchor layer in Ishida '281 can help retain the catalytic substance, it would have been obvious to one skill in the art to shape the catalyst as disclosed in Ishida '281 to form a hollow cylinder as suggested by EP '211 so that the catalyst with improved bonding between the carrier and the catalyst layer can be used in other applications such as in a small internal combustion engine.

Claim 2

Claim 2 further requires a plurality of perforations around the periphery of the corrugated tube.

As stated in the rejection, the metal carrier as disclosed in Ishida '281 can be corrugated (note Figures 3-4) or perforated (note Figure 7). Furthermore, EP '211 also teaches that corrugated, perforated carrier can be used (note Figure 16D).

Appellants argue that Ishida does not disclose or suggested a tube having a corrugated structure or one that can be bent or can be used in a conformable catalyst.

These argument are not convincing for the same reasons as stated above.

Claim 3

Claim 3 further requires that a catalytic coating on the anchor layer to provide a conformable catalyst member.

Ishida '281 fairly teaches a catalytic coating on the anchor layer (note claim 1). For "conformable" limitation, since the carrier in Ishida '281 can be bent, it is considered as being "conformable" as required in Appellants' claim 3.

Other arguments are not persuasive for the same reasons as stated above.

Claim 5

Claim 5 further requires that the tube of corrugated construction comprises alternating rings separated by annular webs.

In both Ishida '281 and EP '211, corrugated structure is disclosed. By nature, corrugated structure has alternating "hills" and "valleys". The hills are considered as the claimed "rings" and the valleys are considered as the claimed "annular webs".

Claim 31

Appellants argue that Ishida '281 and EP '211 do not teach or suggest a carrier having an elongated body portion to be mounted within a curved or bent pipe with a mounting member.

The hollow tube as shown in Figures 2, 3, 5, 6, 9 A-E, etc., has an elongated body portion as required in Appellants' claim 31 and the tube can be positioned in a bent pipe (note for examples, Figures 16A-B) and a support member can be used (note Figures 5-6, item 23).

Appellants further argue that EP '211 does not disclose a carrier having coated thereon an anchor layer suitable for having a catalytic coating applied thereto.

Again, Ishida '281 is applied as stated above to teach the anchor layer. EP '211 is applied to teach various desired shapes for the catalyst.

Claim 32

Claim 32 further requires that the mounting member comprises an annular collar defining a mounting flange.

Again, the support member, item 23 as shown in Figures 5-6, is considered the same as the claimed mounting flange. Varying in design choices for the support member would have been obvious to one of ordinary skill in the art, see In re Dailey as stated above.

Claim 33

Claim 33 further requires that a catalytic material coated on at least some of the body portion of the carrier to provide a catalyst member.

Ishida '281 fairly teaches catalytic material is deposited on the rough surfaces, i.e. anchor layer (note claim 1).

Claim 34

Appellants urge that neither of the cited references teaches a carrier with an intermetallic layer having a face-to-face linear array and forming accordion pleats.

Ishida '281 fairly teaches a carrier with an intermetallic layer having a face-to-face linear array and forming according pleats (note Figure 4). EP '211 is further applied to teach that hollow cylindrical shape is desirable for an analogous catalyst.

Appellants further argue that neither of the cited references teaches a carrier that can be used in a conformable catalyst member that can be placed in a bent or curved configuration.

This argument is not persuasive for the same reasons stated above.

Claim 36

Claim 36 further requires the carrier of claim 34 to have a catalytic coating on the anchor layer to provide a conformable catalyst member.

Again, Ishida '281 fairly discloses a catalytic coating on the anchor layer (note claim 1).

Argument II

Claims 30 and 35

Appellants argue that neither Donomoto nor Draghi cures the deficiencies of Ishida and EP '211.

It should be noted that Donomoto or Draghi is applied to teach suitable materials having heat and corrosion resistance that can be used as the materials for the anchor layer in Ishida '281, not to teach a carrier comprising a tube of corrugated construction.

Appellants argue that impermissible hindsight was used to combine Ishida '281 and Donomoto '770.

Donomoto '770 and Draghi '879 fairly teach that deposited alloys of aluminum and nickel are heat and corrosion resistant, properties desired by Ishida for the anchor layer, thus it would have been obvious to one skilled in the art to use the aluminum-nickel alloys as the material for the anchor layer in Ishida '281 (note Board decision on Application 10/376-836, pages 6-7).

Appellants argue that Donomoto discloses coating a composite fiber/light alloy formed on a body with NiCrAl alloys by plasma spraying to form automobile engine parts, not on a carrier substrate by electric arc spraying to provide a catalyst member.

Regardless of how the NiCrAl alloys were applied and for what purpose, the NiCrAl alloys as disclosed in Donomoto are specifically described as heat and corrosion resistant alloys. Since the metal in Ishida '281 is desired to be heat and corrosion resistance, it would have been obvious to one of ordinary skill in the art to use any

known, commercially available heat and corrosion resistance, such as the NiCrAl alloys suggested by Donomoto, for the product of Ishida '281.

The rejection using Draghi is maintained for the same reason as stated above.

Argument III

Claim 1

Appellants argue that no statement or reasoning as to why one skilled in the art would have combined the teachings of Gorynin and EP '211.

As stated in the above rejection, the catalyst member in Gorynin '302 can be formed by corrugating a catalyst strip and rolling it into a cylinder (note column 9, lines 64-68). EP '211 is applied to teach that the catalyst can be fit in a bent part of a pipe and can be corrugated and perforated. Since the catalysts disclosed in Gorynin '302 and EP '211 are for internal combustion engines, they are considered as analogous catalysts, thus, it would have been obvious to one skilled in the art to use the catalyst as disclosed in Gorynin '302 with the shape and features and in applications as suggested by the catalysts of EP '211.

Claims 2-3, 5-6 and 30-33

Appellants argue that Gorynin '302 fails to teach or suggest the refractory metal carrier having a plurality of perforations formed around the periphery of the tube.

As stated above, EP '211 is applied to teach that the carrier can be both corrugated and perforated (note Figure 16D).

Claim 5

Appellants argue that Gorynin '302 and EP '211 fail to teach or suggest a tube of corrugated construction comprises alternating rings separated by annular webs.

Again, by nature, "corrugated" structure has "hills" and "valleys" which are considered as the claimed "rings" and "annular webs".

Claim 6

Appellants argue that the adhesive layer in Gorynin '302 is formed by plasma spraying, not by electric arc method.

As stated in the above rejection, the limitation required in Appellants' claim 6 is considered as a "product-by-process" limitation. Appellants have not provided any evidence to show that the claimed product is patentably distinct, see In re Brown, In re Fessmann as stated above.

Appellants further argue that Rondeau does not pertain to a catalyst members or teach or suggest the problem of improving the bonding of an anchor layer and a catalyst formed on such an anchor layer.

Rondeau is applied to teach the electric arc spraying can be used instead of plasma spraying, not to teach a catalyst member. Furthermore, Ishida can be applied to teach that the electric arc process of Rondeau can be used in the art of producing a

catalyst member. Furthermore, Gorynin, not Rondeau, is applied to teach the catalyst layer on the intermediate layer and the intermediate layer improves the bonding between the substrate and the catalyst layer.

Appellants argue that Examiner's position appears to be based on impermissible hindsight based on Appellants disclosure, not from any teaching or suggestion found in Rondeau or Gorynin '302.

Rondeau fairly teaches that the adhesion and cohesion of electric arc spraying can be "approximately equal to or greater than" that of thermal spraying exothermic process, such as plasma spraying, thus, it would have been obvious to one skilled in the art to minimize the cost of producing the catalyst by using electric arc process instead of the plasma spraying process (note also Board decision on Application '836, pages 7-8).

Appellants argue that Ishida '281 teaches away from conformable catalyst members.

It should be noted that Ishida '281 is applied in this rejection to teach that electric arc method can be used to form an anchor layer (or adhesive, bonding layer) on a catalyst. For the argument that Ishida '281 teaches away from conformable catalyst members, such argument is not persuasive for the same reasons as stated above.

Claims 31, 32 and 34

The rejection of claims 31, 32, 34 is maintained for the same reasons stated above (note comments stated under "Argument I" for claims 31, 32, 34).

(11) Related Proceeding(s) Appendix

Copies of the court or Board decision(s) identified in the Related Appeals and Interferences section of this examiner's answer are provided herein.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

nmn
07/09/2007

Ngoc-yen Nguyen

NGOC-YEN NGUYEN
PRIMARY EXAMINER
GROUP 1700

Conferees:

Kathryn Gorgos

Stanley Silverman

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MICHAEL P. GALLIGAN,
ALBERT K. BOND AND
JOSEPH C. DETTLING

Appeal 2007-1178
Application 10/376,836
Technology Center 1700

Decided: May 21, 2007

Before EDWARD C. KIMLIN, CATHERINE Q. TIMM, and LINDA M. GAUDETTE, *Administrative Patent Judges*.

KIMLIN, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1-7, 46, and 47. Claims 1 and 46 are illustrative:

1. A catalyst member comprising:

a carrier substrate having a metal anchor layer disposed thereon by electric arc spraying, wherein the anchor layer comprises nickel and aluminum; and

catalytic material disposed on the anchor layer.

46. A catalyst member comprising:

an open carrier substrate selected from the group consisting of at least one of monolithic honeycomb carrier substrate, woven mesh, non-mesh, wadded fibers, and foamed metal, the open substrate having a plurality of fluid flow paths thereon and being characterized by having a portion of the surface area thereof obscured relative to a line of sight from a spray head, the substrate having a metal anchor layer disposed thereon by electric arc spraying the open substrate from the spray head; and

catalytic material disposed on the metal anchor within the gas flow passages.

The Examiner relies upon the following references in the rejection of the appealed claims:

Rondeau	US 4,027,367	Jun. 7, 1977
Ishida	US 4,455,281	Jun. 19, 1984
Donomoto	US 4,798,770	Jan. 17, 1989
Gorynin	US 5,204,302	Apr. 20, 1993
Draghi	US 6,042,879	Mar. 28, 2000

Appellants' claimed invention is directed to a catalyst member comprising a metal anchor layer formed on a carrier substrate by electric arc spraying and a catalytic material disposed on the anchor layer. Claim 1 on appeal recites that the anchor layer comprises nickel and aluminum, whereas claim 46 on appeal defines "an open carrier substrate" selected from the recited group of substrates, e.g., woven and non-woven mesh. Claim 46 also recites that the open substrate has "a plurality of fluid flow paths thereon and

being characterized by having a portion of the surface area thereon obscured relative to a line of sight from a spray head."

Appealed claims 3, 6, 7, and 46 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Ishida. The appealed claims also stand rejected under 35 U.S.C. § 103(a) as follows:

(a) claims 1-7, 46, and 47 over Ishida in view of Donomoto or Draghi,

(b) claims 1, 2, 4, 6, and 7 over Gorynin in view of Rondeau.

We have thoroughly reviewed each of Appellants' arguments for patentability. However, we fully concur with the Examiner that the claimed subject matter is unpatentable over the cited prior art. Accordingly, we will sustain the Examiner's rejections for the reasons set forth in the Answer, which we incorporate herein, and we add the following primarily for emphasis.

We consider first the Examiner's rejection of claims 3, 6, 7, and 46 under § 102 over Ishida. Ishida, like Appellants, discloses a catalyst member comprising a metal anchor layer coated on the substrate by electric arc spraying and a catalytic material disposed on the metal anchor layer. It is Appellants' contention that the substrate of Ishida is not an "open carrier substrate," and also that the catalyst member of Ishida does not have the presently claimed "plurality of fluid flow paths thereon and being characterized by having a portion of the surface area thereof obscured relative to a line of sight from a spray head."

For the claimed "open carrier substrate," Appellants refer to their Specification at page 10, lines 21-27. Appellants assert that the

Specification "distinguishes between the perforated metal plates of the type disclosed in Ishida et al. and the open carrier substrate recited in claims 3, 6, 7, and 47" (page 6 of Brief, second para.). The cited Specification reads as follows:

> An open substrate defines numerous apertures, pores, channels or similar structural features that cause liquid and/or gas to flow therethrough in turbulent or substantially non-laminar fashion and give the substrate a high surface area per overall volume of the flow path of the fluid through the substrate, e.g., features that create a high mass transfer zone for the fluid therein. In contrast, a dense substrate, such as a plate, tube, foil and the like, has a relatively small surface area per overall volume of the flow path through the substrate regardless of whether it is perforated or not, and does not substantially disrupt laminar flow therethrough.

Notwithstanding Appellants' assertion to the contrary, we totally agree with the Examiner that Ishida describes an open carrier substrate which corresponds to the recitation in claim 46 and Appellants' Specification. According to claim 46, a monolithic honeycomb carrier substrate and a mesh qualify as an open carrier substrate, and Appellants' Specification states that substrates having structural features similar to apertures, pores and channels that cause turbulent flow qualify as open substrates. With this in mind, we find no error in the Examiner's factual determination that Ishida expressly describes carrier substrates that are in the form of Appellants' mesh and honeycomb. In particular, the carrier substrate depicted in Ishida's Figure 5 can be reasonably considered a mesh/honeycomb structure, particularly since Ishida specifically teaches that "[a]n

expanded metal refers to a screen-shaped thin metal plate wherein a multiplicity of slits of short length are rendered in alternate and intermittent manner and tensile force is applied perpendicularly to those slits to form meshes," wherein the expanded metal plate of Figure 5 comprises metal portions 6A constituting meshes (col. 4, ll. 4-11). We also find no error in the Examiner's analysis that the perforated metal plate depicted in Figures 9-11 of Ishida can be reasonably characterized as a monolithic honeycomb substrate, and Appellants have not established otherwise (*see* page 5 of Answer, penultimate para.). Moreover, contrary to Appellants' argument, it is not clear on this record that a perforated, tubular metal substrate is not encompassed by the claimed "open carrier substrate," inasmuch as Appellants' Specification states that the perforated, tubular metal substrate of Figure 2H formed "a catalyst member in accordance with the present invention" (page 8 of Specification, ll. 12-13).

We also agree with the Examiner that the claim language "having a portion of the surface area thereof obscured relative to a line of sight from a spray head" is a limitation on the open substrate, not the fluid flow paths thereof, as asserted by Appellants. In essence, we agree with the reasoning set forth at page 11-12 of the Answer, namely, that the backside of Ishida's metal plate and projections are obscured relative to a line of sight from a spray head. Also, we note that it is implicit in Ishida's disclosure at column 6, lines 35 et seq., that catalyst layers disposed at opposite sides of the expanded metal substrate have portions thereof that are obscured relative to the

pertinent line of sight. We also agree with the Examiner that even if, for the sake of argument, the obscured surface area is that of the flow path, "the 'surface area' of the flow paths would be the entire volume of the reactor, which would include the back side of the metal plate" (page 12 of Answer, first para.).

We now turn to the § 103 rejection of claims 1-7, 46, and 47 over Ishida in view of Donomoto or Draghi. Although Ishida, like Appellants, discloses a catalyst member having an anchor layer deposited on a carrier substrate by electric arc spraying, the reference does not expressly teach that the anchor layer comprises nickel and aluminum. However, we concur with the Examiner that Donomoto and Draghi, especially in light of the admitted prior art to Gorynin, evidences the obviousness of utilizing an anchor layer comprising aluminum and nickel for the catalyst member of Ishida. As explained by the Examiner, Donomoto and Draghi establish that it was known in the art that deposited alloys of aluminum and nickel are heat and corrosion resistant, properties desired by Ishida for the anchor layer. Also, Gorynin, as acknowledged by Appellants, specifically discloses an anchor layer for a catalyst on a substrate comprising the presently claimed aluminum and nickel, thereby alleviating any concerns about the compatibility of an anchor layer comprising aluminum and nickel and an overlying catalyst composition. While Appellants argue that Donomoto and Draghi do not teach that intermediate layers of nickel and aluminum have improved heat or corrosion resistance when used

in *intermediate catalyst layers,* we agree with the Examiner that these properties of the alloy are not contingent upon their use.

We are also not persuaded by Appellants' argument that Donomoto, Draghi and Gorynin apply the aluminum/nickel alloy by plasma spraying rather than the claimed electric arc spraying. Appellants submit that one of ordinary skill in the art would not have combined the teachings of these references with Ishida because that "would destroy the desired feature of improving adhesion between the plasma-sprayed layer and a catalyst formed thereon" (page 11 of Brief, penultimate sentence). However, the modification proposed by the Examiner is that it would have been obvious to one of ordinary skill in the art to employ the electric arc spraying of Ishida for depositing an anchor layer comprising aluminum and nickel.

Finally, regarding the § 103 rejection of claims 1, 2, 4, 6, and 7 over Gorynin in view of Rondeau and Ishida, we will sustain the Examiner's rejection for the reasons set forth in our decision in Appellants' co-pending application, U.S. Serial No. 10/376,782, filed February 28, 2003 (Appeal No. 2007-1018). Suffice it to say that we agree with the Examiner that, based on the collective teachings of Gorynin, Rondeau, and Ishida, it would have been obvious for one of ordinary skill in the art to apply the aluminum/nickel-containing anchor layer of Gorynin by electric arc spraying as taught by Rondeau and Ishida. As set forth at pages 8-10 of the Answer, one of ordinary skill in the art would have understood that a certain balance must be effected in the determination of selecting either plasma spraying or

electric arc spraying for depositing the anchor layer, including a typical cost/benefit analysis. Also, from a somewhat different perspective, as already discussed above and in our decision in the co-pending application, we agree with the Examiner that it would have been obvious for one of ordinary skill in the art, based on the teachings of Gorynin and Rondeau, to use an alloy comprising aluminum and nickel for the anchor layer in Ishida.

As a final point, we note that Appellants base no argument upon objective evidence of nonobviousness, such as unexpected results. Indeed, Appellants' Specification attributes no particular criticality to the selection of an alloy of aluminum and nickel for the anchor layer (*see* page 5, ll. 11-18).

In conclusion, based on the foregoing and the reasons well stated by the Examiner, the Examiner's decision rejecting the appealed claims is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(iv)(effective Sept. 13, 2004).

<u>AFFIRMED</u>

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